Two New Species of *Meliosma* (Sabiaceae) from Bolivia

Alba L. Arbeláez
Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166-0299, U.S.A.
alba.arbelaez@mobot.org; albaarbelaez@hotmail.com

ABSTRACT. Two undescribed species of *Meliosma* Blume have been found during revision of the Bolivian material of the genus for the checklist of the Bolivian vascular plants: *Meliosma minutipetala* Arbeláez, having the smallest inner petals of any *Meliosma* species reported from the Neotropics, and *M. petalodentata* Arbeláez, having both the outer and inner petals dentate. A key to the eight species known from Bolivia is provided.

RESUMEN. Dos especies aún no descritas del género *Meliosma* Blume fueron encontradas durante la revisión del material boliviano de este género para el "checklist" de las plantas vasculares de Bolivia: *Meliosma minutipetala* Arbeláez, la cual tiene los pétalos internos más pequeños de todos aquellos reportados previamente para cualquier especie de *Meliosma* en los Neotrópicos, y *M. petalodentata* Arbeláez, la cual tiene tanto los pétalos externos como los internos dentados. Se presenta una clave para las ocho especies de *Meliosma* que se conocen de Bolivia.

Key words: Bolivia, *Meliosma*, Sabiaceae, South America.

Sabiaceae comprise 3 genera and about 90 species, disjunct between Southeast Asia and tropical America. *Sabia* Colebrooke is a tropical Asian genus with 19 species (Chen, 1943; Van de Water, 1980); *Ophiocaryon* Endlicher, with about 7 species, is confined exclusively to northern South America (Gentry, 1980); and *Meliosma* is a genus with ca. 15 species in Southeast Asia and ca. 50 species in the Neotropics (Gentry, 1986).

Meliosma trees are used as timber in the Neotropics, and a few Asian species are cultivated as ornamentals. The Neotropical species are distributed from Mexico and the West Indies to Brazil and Bolivia and are typically found in evergreen moist and cloud forest (Gentry, 1980). Van Beusekom (1971) stated that self pollination (not so much of individual flowers, but especially between different flowers of the same plant) possibly accounts for the local endemism of the *Meliosma* species; they are usually isolated from each other, either geographically or ecologically by altitude or habitat. In the field it is known that the fruits remain on the trees for long periods of time. It is difficult to obtain collections with flowers, and since the floral characteristics are the principal feature used to distinguish species, without them many collections are impossible to determine.

Meliosma Blume, Catalogus 10–11. 1823. TYPE: *Meliosma lanceolata* Blume (lectotype, designated by Van Beusekom, 1971: 430).

Trees and shrubs; leaves alternate to suboppposite, simple or pinnately compound, frequently clustered at the twig apices; inflorescence mostly a leafy terminal panicle, 3 or 4 times branched, without clear demarcation between twig and rachis, sometimes racemose or cymose; flowers small, essentially 5-merous and usually perfect, often in glomerules, very crowded, sessile or almost so; sepals 5, imbricate (the outer 2 may be ± reduced, similar to a bracteole), glabrous or fimbriate on the outside; petals 5, 3 outer ones large and 2 inner ones ± reduced; fertile stamens 2 (5 in *M. herbertii*), attached at base to the inner petals, anthers 2-locular, the thecae short and thick, transversely dehiscent, often separated by the thickened connective, the staminodes 3, forming a cap over the pistil; ovary ovoid to conical or complanate, 2-locular, 2 ovules/locule, style usually bifid or simple, disc surrounding the ovary, usually with 5 teeth, 4 of them paired (each pair coinciding with the inner petal base position) and one solitary; fruit drupaceous, globose to obovoid and single-seeded, exocarp fleshy, endocarp woody and sculptured; seeds with little or no endosperm.

The genus *Meliosma* has been divided as follows by Van Beusekom (1971), mostly based upon endocarp characteristics and also flower and leaf characters:

Meliosma subg. **Kingsboroughia** (Liebmann) Beusekom
sect. *Hendersonia* Beusekom → Southeast Asia (1 sp.)
sect. *Kingsboroughia* → Southeast Asia (2 spp.)

Meliosma subg. **Meliosma**
sect. *Meliosma* → Southeast Asia (12 spp.)
sect. *Lorenzanea* (Liebmann) Beusekom → Neotropics (ca. 50 spp.)

Fifteen species were recognized by Van Beusekom (1971) in the revision of the Southeast Asian sections of *Meliosma*. Section *Lorenzanea* is restricted to the Neotropics and has never been monographed. All but one of the New World species, *M. alba* (Schlechtendal) Walpers of Mexico, belong to subgenus *Kingsboroughia*. *Meliosma alba* also occurs in south-central China, and it is the only New World species of the genus with compound leaves. A few revisions of the genus in some countries exist, e.g., *Flora de Colombia* (Cuatrecasas & Idrobo, 1955) and *Flora of Panama* (Gentry, 1980).

Ruíz de Centurión (1993) reported five species of *Meliosma* in Bolivia, two of them undetermined. The two undetermined species correspond to *M. frondosa* Cuatrecasas & Idrobo and *M. solomonii* A. H. Gentry, respectively, for a total of three species instead of five. The present study recognizes eight species. *Meliosma glabrata* (Liebmann) Urban and *M. herbertii* Rolfe (the more common species in Bolivia) are found only below 1000 m elevation in humid montane forest with some kind of disturbance or in occasionally inundated forest. Four species, *M. boliviensis* Cuatrecasas, *M. frondosa*, *M. solomonii*, and *M. wurdackii* Cuatrecasas, show a great elevational range, being found from 100 to above 3000 m, in cloud forest and Amazonian forest. The two new species described here, *M. minutipetala* and *M. petalodentata*, are known from the departments of La Paz and Cochabamba, at elevations between 2200 and 2800 m, in moist montane (yungas) forest with some disturbance.

KEY TO THE SPECIES OF *MELIOSMA* FROM BOLIVIA BASED ON FLOWERING MATERIAL

1a. Inner petals bifid.
  2a. Outer petals with dentate-fimbriate margin; filament 1.4–1.6 mm long . . . . . *M. petalodentata* Arbeláez
  2b. Outer petals with entire margin; filament ca. 1 mm long.
    3a. Inner petals less than 1 mm long; leaves irregularly arranged and clustered, 5–20 cm long, 1–4 cm wide, coriaceous . . . . . *M. solomonii* A. H. Gentry
    3b. Inner petals 1–1.2 mm long; leaves alternate, 25–30 cm long, 10–13 cm wide, chartaceo-membranaceous . . . . . *M. wurdackii* Cuatrecasas
1b. Inner petals entire.
  4a. Inner petals shorter than or equal to filament, adnate completely to filament.
    5a. Inner petals transversely oblong, ca. 0.2 mm long, about half the filament length, apex truncate-retuse to somewhat rounded . . . . . *M. minutipetala* Arbeláez
    5b. Inner petals ovate, ca. 0.5 mm long, ± equal to filament length, apex obtuse . . . . . *M. frondosa* Cuatrecasas & Idrobo
  4b. Inner petals longer than the filament, only basally adnate to the filament.
    6a. Inner petal linear, ca. 2 mm long, twice the length of the filament . . . . . *M. glabrata* (Liebmann) Urban
    6b. Inner petal spatulate or orbicular-obovoid, 0.5–1.5 mm long, its length closest to that of the filament.
      7a. Inner petal spatulate; the 2 segments of the stigma not divergent; outer petals with minutely dentate margins; 2 fertile stamens per flower . . . . . *M. boliviensis* Cuatrecasas
      7b. Inner petal orbicular-obovoid; the 2 segments of the stigma divergent; outer petals with entire margins; 5 fertile stamens per flower . . . . . *M. herbertii* Rolfe

Meliosma minutipetala Arbeláez, sp. nov. TYPE: Bolivia. La Paz: Murillo, valle del Río Zongo, 32.1 km al N de la cumbre, cerca de la boca del Río Jachcha Cruz, 2200 m, 14 Feb. 1988, 16°07′S, 68°04′W, *J. C. Solomon 17833* (holotype, MO; isotype, LPB). Figure 1.

Arbor circa 4 m alta. Lamina obovata, 23.5–31 cm longa et 9.3–12 cm lata, glabra. Inflorescentia sparsim puberula; flores sepalis (1.05–)1.2–1.3 (1.45) mm diametris, petalis interioribus 0.20–0.24 mm longis et 0.24–0.36 mm latis.

Tree 4 m tall; branchlets rounded, surface grayish, longitudinally very finely ridged with large raised scattered lenticels, mostly glabrous, with few and inconspicuous reddish trichomes. Lamina obovate, 23.5–31 cm long, 9.3–12 cm wide, apex broadly cuneate to rounded, sometimes slightly apiculate, base cuneate, rather coriaceous, margins entire, the main vein strongly impressed above, strongly raised below, secondary veins slightly impressed above, strongly raised below, both sides mostly glabrous, abundant golden reddish trichomes present along the midvein below when young, persistent at base of the secondary venation abaxially at maturity; petiole 3–6 cm long, with small scattered lenticels. Inflorescence terminal, and from the upper foliate axils, paniculate, ca. 35 cm long, rachis straight, grayish and strongly lenticellate, sparsely puberulous, lateral branches to 12, completely covered by golden trichomes, lenticellate; pedicels to 0.5 mm long. Flowers seen only in bud; sepals 5, orbicular, (1.05–)1.2–1.3(1.45) mm diam., margins long fimbriate, two

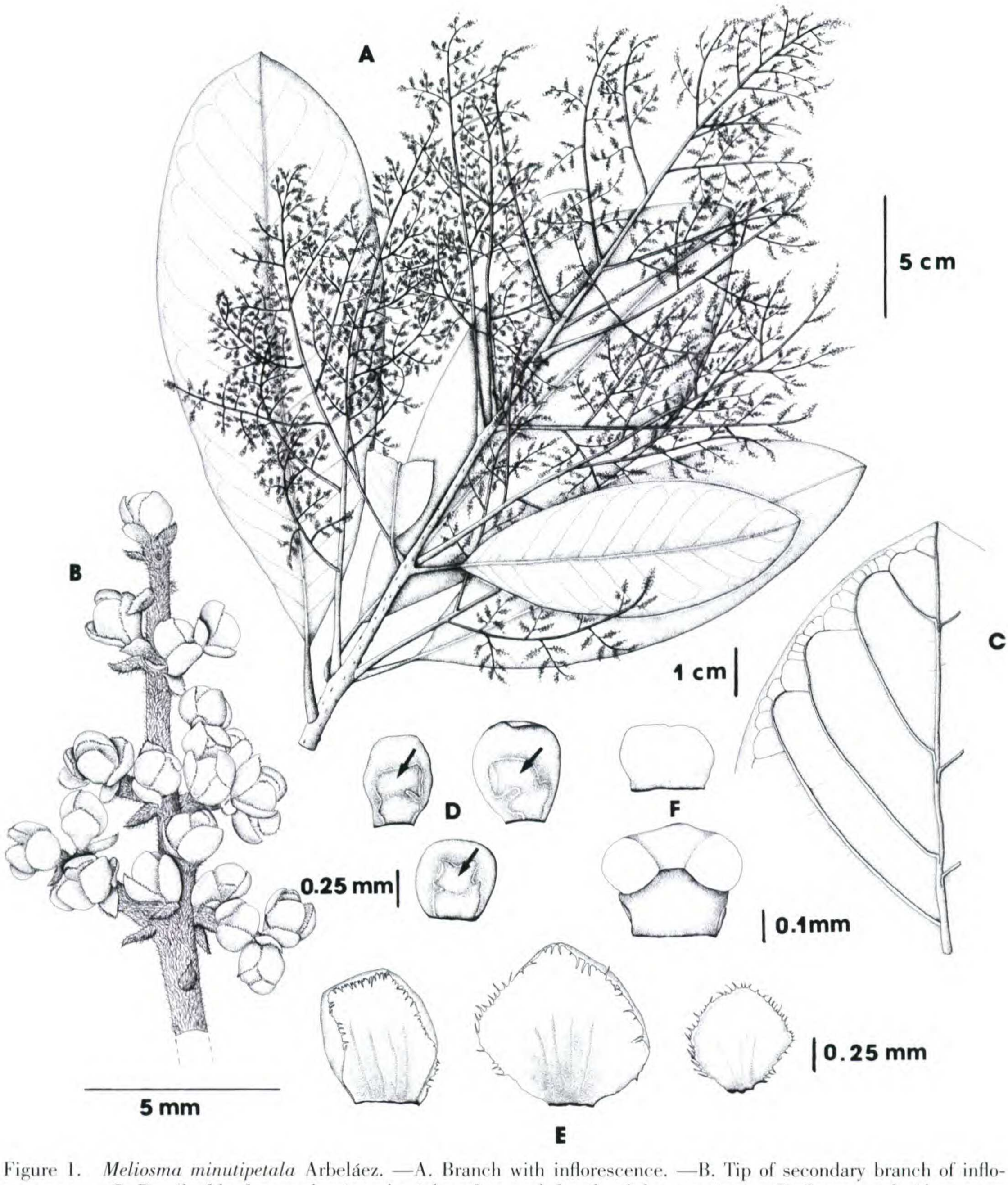

Figure 1. *Meliosma minutipetala* Arbeláez. —A. Branch with inflorescence. —B. Tip of secondary branch of inflorescence. —C. Detail of leaf apex showing abaxial surface and details of the venation. —D. Outer petals (the arrows showing the staminodes). —E. Sepals. —F. Fertile stamen and inner petal. (Illustrations from *J. C. Solomon 17833.*)

outer ones fimbriate on the outside surface; petals 5, glabrous, outer petals 3, ovate to obovate, the outermost 0.7–1 mm long, 0.6–0.7 mm wide, internal two 0.52–0.63 mm diam., inner petals 2, transversely oblong, 0.20–0.24 mm long, 0.24–0.36 mm wide, truncate-retuse to somewhat rounded at apex; fertile stamens 2, thecae suborbicular, each 0.18–0.26 mm long, separated by thickened connective tissue, including connective tissue 0.42–0.58 mm across, the filament 0.24–0.4 mm long, 0.28–0.4 mm wide, completely adnate to the inner petal; pistil ca. 0.4 mm long, glabrous, ovary complanate. Fruits not known.

Distribution. This species is only known from the type specimen, collected at 2200 m elevation in humid forest north of La Paz.

Meliosma minutipetala is close to *M. frondosa*,

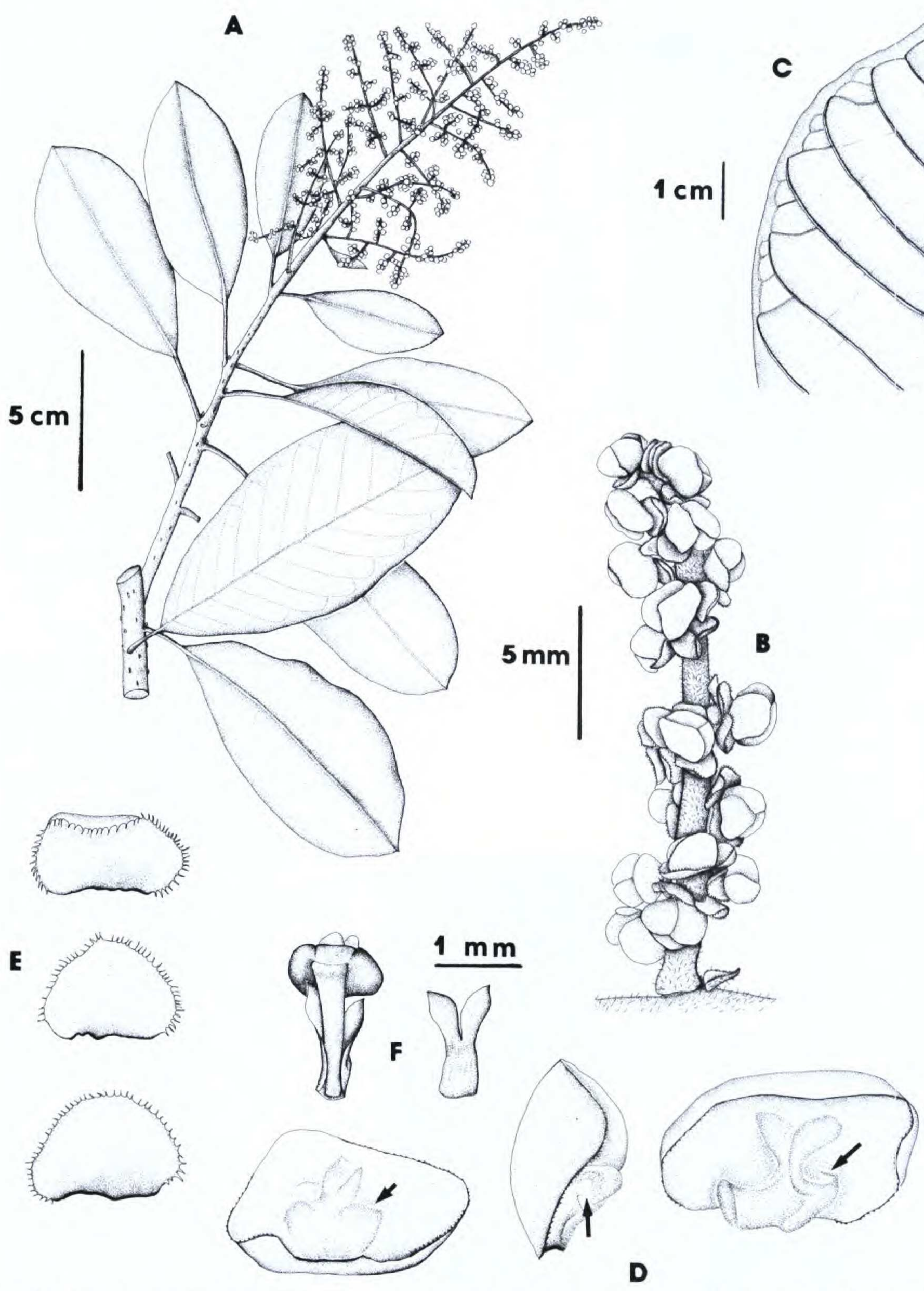

Figure 2. *Meliosma petalodentata* Arbeláez. —A. Branch with inflorescence. —B. Secondary branch of inflorescence. —C. Detail of leaf apex showing abaxial surface and details of the venation. —D. Outer petals (the arrows showing the staminodes). —E. sepals. —F. Fertile stamen (+ inner petal) and inner petal. (Illustrations from *J. C. Solomon 8964*.)

both species having sepals much larger than the outer petals, and the sepals completely enclosing the rest of the flower. *Meliosma frondosa* differs from *M. minutipetala* by having the secondary branches of the inflorescence somewhat crowded together at the base (vs. secondary branches spread out), the inner petals ovate and as long as the filament (vs. transversely oblong and about half the length of the filament), the leaves rounded at base and apex (vs. broadly cuneate to rounded at the apex, sometimes slightly apiculate, cuneate at the base).

Meliosma minutipetala is a distinctive species, having by far the smallest inner petals (to 0.24 mm long, as seen in bud) of those that have been previously reported for any *Meliosma* species in the Neotropics (e.g., *M. frondosa*, to which it is closely related, and *M. simiarum* A. H. Gentry, from northern Peru). The minute inner petals of *M. minuti-*

petala easily separate this species from the other Neotropical species of *Meliosma*.

Meliosma petalodentata Arbeláez, sp. nov. TYPE: Bolivia. La Paz: Murillo, 27 km N (below) of dam at Lago Zongo, 2500 m, 27–28 Nov. 1982, 16°08′S, 68°06′W, *J. C. Solomon 8964* (holotype, MO). Figure 2.

Arbor circa 8 m alta. Lamina elliptica, 28 cm longa et 11.5 cm lata, pagina superiore glabra, pagina inferiore glanduloso-punctata et/vel trichomatibus praedita. Inflorescentia sparsim glanduloso-punctata et/vel trichomatibus praedita; flores sepalis 1.4–1.8 mm longis et 1.6–2 mm latis, petalis interioribus bifidis, 1.2–1.5 cm longis, 0.9–1.4 cm latis.

Tree ca. 8 m tall; branchlets somewhat angled to subterete, surface brownish, longitudinally finely ridged with raised scattered lenticels, with few minute and inconspicuous ascending reddish trichomes. Lamina elliptical, 5.5–28 × 2.5–11.5 cm, apex broadly cuneate to slightly rounded, base mostly cuneate, rather coriaceous, margins entire, the midvein strongly impressed above, strongly raised below, secondary veins plane above, raised below, mostly glabrous above except for glandular-punctuate and/or few reddish trichomes on the mid and secondary veins, glandular-punctate and/or abundant reddish trichomes covering all the surface below; petiole 1.6–3.5 cm long, with at most a few tiny lenticels. Inflorescence terminal, paniculate, 13–25 cm long, rachis straight, brownish and strongly lenticellate, with reddish ascending trichomes and/or glandular-punctate on the surface, lateral branches to 12, completely covered by trichomes, lenticellate; pedicels to 1 mm long. Flowers white; sepals 5, orbicular, 1.4–1.8 mm long, 1.6–2 mm wide, the margins long fimbriate, two outer ones long fimbriate on the outside surface; petals 5, glabrous, outer petals 3, oblate, 1.8–3 mm long, 2–3.7 mm wide (outermost largest), margins dentate-short fimbriate, inner petals 2, bifid, 1.2–1.5 mm long, 0.9–1.4 mm wide, each segment acute, margins distally minute-dentate; fertile stamens 2, thecae suborbicular, each ca. 0.6 mm long, slightly separated by connective tissue, including connective tissue 1.2–1.3 mm across, the filament 1.4–1.6 mm long, 0.3–0.4 mm wide, attached to about ⅓ of the inner petal length; pistil ca. 1.2 mm long, glabrous, ovary ovoid. Fruit not known.

Distribution. The species was first collected by Steinbach more than 70 years ago. It is apparently endemic to the montane humid forest of west-central Bolivia in Murillo and Chapare Provinces.

Meliosma petalodentata somewhat resembles *M. solomonii*. *Meliosma petalodentata* is characterized by petals (outer and inner) with crenate-dentate margins (vs. entire margin), the outer petals usually more than 3 mm wide (vs. ca. 2 mm), the filament more than 1 mm long (vs. to 1 mm long). The collection [Bolivia. La Paz: Nor Yungas, 72 km hacia Coroico (500 m después de La Cumbre), 3050–3150 m, 16°15′S, 67°20′W, *Beck 1836* (MO)] identified as *M. frondosa* is a mixed collection.

Most species within the genus have both petals with entire margins; however, sometimes species such as *M. occidentalis* Cuatrecasas (Costa Rica to Ecuador) and *M. grandiflora* C. V. Morton ex A. H. Gentry (Costa Rica and Panama) have the outer petals with limited dentate margins. The characteristic of having both outer and inner petals dentate separates this species from all other Neotropical *Meliosma* species.

Paratype. BOLIVIA. **Cochabamba:** Chapare, Wald Aduana-Incachaca, 2800 m, 10 Mar. 1929, 17°20′S, 65°45′W, *Steinbach 9593* (MO, US).

Acknowledgments. I thank the curators at LPB, MO, and USZ for permitting the examination of specimens during my visits and sending the plants required for loans to complete my study. I also thank Olga Martha Montiel at the Missouri Botanical Garden for making my stay in Bolivia possible, Steven Churchill and Charlotte Taylor for comments on the manuscript, and Peter Stevens for carefully checking over the manuscript.

Literature Cited

Chen, L. 1943. A revision of the genus *Sabia* Colebrooke. Sargentia 3: 1–75.

Cuatrecasas, J. & J. M. Idrobo. 1955. El género *Meliosma* en Colombia. Caldasia: 187–211.

Gentry, A. H. 1980. Sabiaceae. *In*: Flora of Panama, Part VI. Ann. Missouri Bot. Gard. 67: 949–963.

———. 1986. New Neotropical species of *Meliosma* (Sabiaceae). Ann. Missouri Bot. Gard. 73: 820–824.

Ruíz de Centurión, T. 1993. Sabiaceae. Pp. 714–415 *in* T. J. Killeen, E. Garcia E. & S. G. Beck (editors), Guía de Arboles de Bolivia. Herbario Nacional de Bolivia and Missouri Botanical Garden, St. Louis.

Van Beusekom, C. F. 1971. Revision of *Meliosma* (Sabiaceae), section *Lorenzanea* excepted, living and fossil, geography and phylogeny. Blumea 19: 356–539.

Van de Water, P. M. 1980. A taxonomic revision of the genus *Sabia* (Sabiaceae). Blumea 26: 1–64.